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Inventor(s): Cathey

What is claimed is:

1. A process for fabricating emitters, said process comprising the following steps of:

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forming a dopant concentration gradient in a substrate;

patterning said substrate;

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selectively removing portions of said substrate, thereby defining emitters.

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2. The process according to Claim 1, wherein said emitters are formed from upright structures, said upright structures being tapered by a consumptive process.

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3. The process according to Claim 1, further comprising the step of:

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sharpening said emitters, wherein said sharpening comprises oxidation, said emitters oxidize at a rate which is a function of said dopant concentration gradient.

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4. The process according to Claim 1, wherein said patterning employs a photoresist/silicon nitride/silicon oxide sandwich.
- 5 5. The process according to Claim 4, wherein said dopant concentration gradient decreases with depth into said substrate.
- 10 6. The process according to Claim 4, wherein said dopant concentration gradient increases with depth into said substrate.
- 15 7. A method for manufacturing emitters, said method comprising the following steps of:
- 20 selectively removing portions of a substrate, thereby forming emitters, said substrate comprising a dopant, said dopant forms a gradient in said substrate, said selective removal comprising etching.

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8. The method according to Claim 7, wherein said gradient decreases with depth into said substrate, said etching having a rate which decreases as the gradient decreases.

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9. The method according to Claim 7, wherein said gradient increases with depth into said substrate, said etching having a rate which increases as the gradient decreases.

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10. The method according to Claim 8, wherein said dopant comprises at least one of arsenic, phosphorus, and boron.

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11. The method according to Claim 10, further comprising the step of:

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patterning said substrate, said pattern being formed with a mask, said mask comprising a photoresist/silicon nitride/silicon oxide sandwich.

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12. The method according to Claim 11, further comprising the step of:

5 oxidizing said substrate, said substrate comprising silicon.

10 13. The method according to Claim 12, wherein said emitters are incorporated in an electron emission device.

14. An emitter comprising:

15 an apex and a base;

a dopant concentration, said concentration being in a gradient, wherein said concentration is greater at said apex and decreases toward said base.

20 15. The emitter of Claim 14, wherein:

25 said gradient is effected by diffusion doping.

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16. The emitter of Claim 15, wherein:

5 said gradient is affected by diffusion doping, followed
by etching, the dopant differential being used to produce a
sharpened tip or edge, thereby increasing an available process
window for manufacturing emitters with higher aspect ratios.

10 17. The emitter of Claim 14, wherein said dopant concentra-
tion comprises at least one of arsenic, boron, and phosphorus.

15 18. The emitter of Claim 15, wherein said emitter is disposed
in an array of similar emitters.

19. The emitter of Claim 15, wherein said emitter is disposed
in a pixel.

20 20. The emitter of Claim 15, wherein said emitter is disposed
in a display device.

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21. The emitter of Claim 15, wherein said emitter is disposed in a field emitter device.

5 22. The emitter of Claim 15, wherein said emitter has an aspect ratio greater than 1:1.

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